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ABSTRACT

The Washington Library Network is developing a computer assisted bibliographic system to speed and expand library operations throughout the state. Features include Machine Readable Cataloging (MARC) format with all content designators, subject and name authority files, sorting by Library of Congress rules, and stringent quality control. Future modules will add acquisition/accounting and circulation support. On-line capabilities are presently under development. This paper describes the present batch-mode cataloging subsystem and the developmental efforts toward on-line, integrated acquisitions and cataloging support.
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THE WASHINGTON LIBRARY NETWORK'S COMPUTERIZED BIBLIOGRAPHIC SYSTEM

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March 1975

IR 003 580

ABSTRACT

The Washington Library Network is developing a computer-assisted bibliographic system to speed and expand library operations throughout the state. Features include MARC format with all content designators, subject and name authority files, sorting by LC rules, and stringent quality control. Future modules will add acquisition/accounting and circulation support. On-line capabilities are presently under development.

This paper describes the present batch-mode cataloging support subsystem, its history, operation, impacts, problems, costs. Present developmental efforts toward on-line integrated acquisitions and cataloging support are indicated.

INTRODUCTION

The Washington Library Network (WLN) is developing a computer system to speed and expand library operations. The WLN emphasizes the sharing of resources among all types of libraries and the economies of a centralized computer-communications system to provide assistance for libraries' internal functions, boosting the power of libraries to respond to today's rapidly increasing information demands within ever-tighter funding patterns. Such a system would incorporate at least the following qualities:

- Adaptability to various computer configurations and library requirements;
- Ability to access and update current data in an on-line mode;
- Assistance to most library functions: order and receipt, cataloging and processing of materials, accounting, circulation, reference searching;
- Ability to handle all kinds of bibliographic records;
- Careful quality control for accuracy and completeness of data;
- Ability to intake and output MARC II formatted records, for standardized communication with other libraries' computer systems;
- Capacity to serve multiple libraries in a network configuration.

This computer-communications system is designed with the potentiality to be broadened to a multi-state network, to be interfaced with or be emulated by other libraries' or states' computer systems, and subsequently to become an integral part of national and international information networks.

A basic assumption is that the totality of library information in any area or state or region or in the entire nation is a people's resource which, as with the educational system, should be sustained and made available equally to all in the public interest. All citizens regardless of domicile location or economic or physical problems should expect convenient access to library resources and information services for their self-enrichment, economic well-being and entertainment. With the help of new technologies, the ability of libraries to provide their constituents with wanted resources can be improved. The Washington Library Network is the outgrowth of statewide planning to realize this overriding concern.

ENVIRONMENT OF SYSTEM

Library development in Washington encompasses a long history of intrastate and interstate cooperation. An early expression of the latter is the establishment of the Pacific Northwest Bibliographic Center in 1940 to serve Montana, Idaho, Oregon, Washington, and British Columbia (later adding Alaska); PNBC was reorganized in 1970 to improve the interlibrary loan flow throughout the region. Based on a long-range library development plan initiated by the Washington Library Association in the 1930's, 15 district library systems now coordinate public library services to over 60% of the state's population. (Only 4% of the population lack public library service at present, with 36% served by municipal and club libraries.) Active cooperation continues to expand with such endeavors as community college consortia, area programs involving various types of libraries, liberalized interlibrary loan procedures, and multi-district patron cards. Various intrastate serials listings have been published: e.g., a statewide serials title list, a serials holdings

list at the University of Washington, and a union list of serials holdings for the libraries in the Spokane area. The State Controlled Area Network telephone service has been extended to public and academic libraries throughout Washington to facilitate resource sharing. Leaders in the library profession have over the years sustained the vision and the climate for such a statewide effort as the Washington Library Network's computer system.

The chronology of data processing in Washington libraries goes back at least to 1951, when the King County Library began publication of the earliest continuous machine-based public library book catalog in the nation. From 1966 to 1968, the Washington State Library (WSL) participated in the Library of Congress' MARC I pilot project, utilizing the MARC I tapes to produce catalog cards, book cards, pocket and spine labels, and a rudimentary book catalog. In 1967 the state's library profession accepted in principle the Becker and Hayes report, A Proposed Library Network for Washington State, and designated the State Library as responsible for spearheading development of the Washington Library Network.[1] Additional studies by State Library personnel laid the groundwork for more specific decisions.[2-4]

On the basis of these studies and experiences, Washington librarians, agreed on the desirability of developing a computer system to aid the state's libraries in coping with the ever-growing problems of handling information. A prime goal of the system is to expedite the sharing of resources among all libraries of the state, so that a citizen anywhere in the state might have access to material in any library of the state. At the same

time, the system is expected to improve the efficiency and economy of libraries' operations through reduction of duplicate acquisitions, better control of bibliographic records, improved interlibrary communication--in general, service to users is to be improved without proportional increase in expenditures.

The system must assist all types of libraries in their appropriate internal functions, and must be capable of dealing with various types of materials. Structurally, a centralized computer hardware facility was envisioned with sub-centers for some area cooperative functions such as materials processing or bibliographic referral, these functions to be determined on the basis of evolving experience. Additionally, the system must be capable of becoming a node in a national bibliographic network--and as a corollary, adherence to the MARC II communications format is a stated requirement as the basis for external compatibility.

With these requirements in view, computer-assisted library systems throughout the nation were surveyed and evaluated. Each system failed in some aspect to meet all the basic criteria: most were designed for utilization by a single library, e.g., Bibliographic Automation of Large Library Operations using a Time-sharing System (BALLOTS); or were limited to serving only some of the desired gamut of library functions, e.g., New York Public Library (NYPL); or lacked adequate provision for quality control, e.g., Ohio College Library Center (OCLC). The one weakness seemingly common to all was an inability to create local records in the MARC II format with all content designators, and to output records in the same standard communications format. On the basis of this evaluation, it was decided that no existing system should be adapted, but a computer system

must be developed to match the Washington Library Network's specifications.

PILOT SYSTEM

In 1971 the Washington State Library Systems Group and a team of consultants completed the preliminary design of a Basic Bibliographic System for the Washington Library Network. In this study the file structure and the file access and retrieval methods were defined, the major program modules were identified, and the data flow described. This work was the basis for the computer system design for the Resource Directory Pilot Project.

In spring 1972, funding was provided by the state legislature and a contract was entered with Boeing Computer Services (BCS) for technical design and development, pursuant to a decision that WSL would establish an in-house technical staff only for operations, not for development. The Boeing Technical Library and BCS had prior experience in library automation, having developed and operated the MECCA (MEchanized Card CAtalog) system since 1963.[5] To insure that library need would override technological convenience, WSL specified that a librarian must be head of the technical team to fulfill the contract, and the director of the Boeing Technical Library was transferred to BCS to manage the team. The contract provided that the system when developed would be installed in the state Data Processing Service Center (DPSC) and that the software would be under the control of Washington State.

The Resource Directory Pilot Project had the following deliverable objectives:

1) create a data base of bibliographic and location records for monographs acquired by participating libraries;
2) produce a Pilot Resource Directory for the participating libraries;
3) maintain a data base of all Library of Congress MARC records;
4) provide cataloging information so that duplication of searching and original cataloging are minimized;
5) provide experience in the operation of computerized systems for producing a directory;
6) provide a cost analysis to determine the economic feasibility of a statewide resource directory and/or custom directories for areas or for individual libraries.

The pilot system as outlined in early 1972 was to evaluate the feasibility of the generalized system design and specifically to test the practicality of the resource directory function. State-level professional groups reached consensus on other requirements: rigorous quality control, development of an authority file, capability of sorting by library rules rather than the usual computer style. The form of the Resource Directory was defined; input, output, system logic, file layouts and record formats were described.

The products of the proposed network included publication of a directory of the holdings of libraries throughout the state (Resource Directory); cataloging and processing materials; bibliographic information; and assistance for acquisitions, circulation, and reference functions. Resource Directory production was evaluated as the most

complex and difficult of these tasks; it was therefore selected as the focus of the pilot system, since if Resource Directory publication were not feasible then the network structure as envisioned would have to be modified radically.

In 1972 the computer programs were designed, coded and checked out, with technical expertise provided by BCS under contract. Program modules were integrated and the system was tested. An Input Center was established at the State Library and personnel were trained in MARC editing and keyboarding for input. A Resource Directory Advisory Committee was set up, with representation from the participating libraries, consultants and all types of libraries. This group and its sub-groups conferred frequently to assess progress and to discuss policy decisions. The State Library's technical services personnel worked closely with Boeing Computer Services to implement decisions and to provide detailed interpretations for programmers. In May cataloging records in proofsheet form began to be provided from the computer for participating libraries to establish a standard pattern for local cataloging and to integrate machine-produced cataloging with extant systems. A two-day workshop was held in June 1972 for catalogers and other staff from the participating libraries. This session included an introduction to MARC editing and orientation in the system's operation.

Participants in the pilot were six district system libraries and the Washington State Library (representing 90 libraries altogether). Early plans had included all types of libraries, but time pressures allowed for minimal training and standardization efforts and it was

therefore decided to limit participation to a relatively homogeneous group. The system libraries were chosen primarily on the basis of need: branch libraries had no information on the total system's holdings and in two of the headquarters no central card catalog existed; the Resource Directory was thus an immediately useful tool to the participants. The pilot system was in action from July through September 1972, using Library of Congress MARC tapes, receiving acquisitions information from the participating libraries, and providing cataloging information from MARC records or local input for the titles ordered. The pilot development concluded in December 1972 with the publication of the Pilot Resource Directory, BCS completing the contract within the 9-month schedule and at a cost below the contract bid. The system was installed in the State Data Processing Service Center in January 1973 for on-going operation; political considerations dictated the hardware environment, though for some months service was unreliable. The tight schedule and cost restrictions necessitated some compromises in development: insufficient attention could be devoted to system design, e.g., three of the four main segments of the weekly run required human examination of output prior to starting the next segment; alternative file structures and data manipulation procedures could not be thoroughly investigated; documentation and cost analysis were delivered at a later date; optimizing of the system was not possible within the time frame, the manual operation's details could not be sufficiently analyzed, and as mentioned above only public library systems were included in the pilot. Of these potential problem areas, the manual interface presented the most immediate limitations to the system's operation, and will be described below.

The computer system was installed at the Washington State DPSC on an IBM model 370/145 and subsequently, when the DPSC changed computers, shifted over to a 360/65 with OS/MVT. Operation in 1973 required 200K core, four 9-track magnetic tapes, four (now six) IBM 3336 disk packs, 1403 printer, and ALA print train. Programs were written in PL/1 (75 routines, 16,800 statements), and BAL (32 routines, 15,900 statements). Input is via punched cards, modified IBM Magnetic Tape Selectric Typewriter (MTST) and Digidata converter, and LC-MARC tapes.

SPECIAL FEATURES OF THE WLN SYSTEM

The Washington Library Network computer system is designed to serve most internal library functions in a network of all types of libraries. Other networks, such as OCLC, have been limited to a few functions such as cataloging and interlibrary loan support, and single library systems such as Stanford's BALLOTS have provided support to most library functions; WLN was undertaken with both aspects as major considerations. (Both the mentioned systems are now moving toward this combination of aspects.)

A machine-readable authority file with name, subject and cross references has been incorporated. The WLN authority subsystem is now a single set of authorities; it is expected that as the on-line network expands to more participants, a multiplicity of authority files may exist, some shared by several libraries and some unique to a specific library or unit within a library. Central monitoring will be necessary for any shared authority files.

The WLN system maintains the complete MARC data base, with no records eliminated or curtailed and with all content designators retained.

WLN's system has the ability to output records in the fully-coded LC-MARC communications format; in fact, a test tape sent in the spring of 1973 to the Library of Congress, containing WLN locally input records was run through LC's system with no problems. The data was read into LC's programs which translate from MARC communication format to LC's internal format and catalog cards were then produced from LC's programs. The necessity for communication among systems has become evident as national bibliographic exchange is envisioned, and other major systems (e.g., OCLC, BALLOTS) are now making the effort to develop this capacity for outputting in standard communication format.

The sort programs enable the computer to produce listings based on filing rules developed by John Rather at the Library of Congress;[6] these sorts are used for the Resource Directory, two-week interim listings of titles received, and vocabulary lists, and can sort records for CRT display. The Library of Congress has purchased these sort key generating programs and incorporated them into its internal system for terminal display and book catalog production.

The quality control routines of the WLN system require stringent manual screening procedures for content and content designators. Some alterations in methods will be necessitated by the on-line operation, but centralized control will continue to maintain high standards. At present, input of a local record averages about 20 minutes in manual effort, including tagging, vocabulary searching, MTST keying, proofing MTST hard copy, and proofing computer listings against worksheets but not including cataloging time.

SYSTEM OPERATION

Although the pilot system was set up in batch mode, the long-term plan is to establish an on-line computer network in a telecommunications environment. Since funding was unavailable for immediate development of the on-line system following the pilot, the WLN system has operated in a weekly batch pattern during 1973 and 1974. The 1974 state legislature voted funding for the on-line design and development; these efforts are underway at the present writing (spring 1975). Current operations continue in the interim batch mode as diagrammed in Figures 1 and 2, and more fully described below.

Since the pilot project ended, two more district libraries and a four-year college library have become participants in the system, bringing the total number to ten (representing 120 member libraries):

The Evergreen State College Library, Olympia
Fort Vancouver Regional Library, Vancouver
Kitsap Regional Library, Bremerton
Mid-Columbia Regional Library, Kennewick
North Central Regional Library, Wenatchee
Pierce County Library, Tacoma
Spokane County Library, Spokane
Timberland Regional Library, Lacey
Sno-Isle Regional Library, Marysville
Washington State Library, Olympia

The data base now includes records for films as well as for monographs, and serials records will soon be added. Production of catalog cards as

well as computer-printed labels for processing has been ongoing since 1973. Refinement of system capabilities has been a continuous process, as problems and needs have become evident.

Manual System. As shown in the flow diagram (Figure 3) each participating library sends to Washington State Library one copy of its multiple order form for each new title. At WSL a Request for Cataloging Data (RCD) card is keypunched for each order form to initiate search of the data base for a matching bibliographic record. If a hit results, the catalog cards and spine and pocket labels are printed by the computer and forwarded from WSL to the ordering library, with a computer-produced punched Report of Title Received card (RTR), which is to be returned by the library at time of receipt of book. This second punched card triggers the linking of the holding library's symbol to the appropriate bibliographic record. Hits by title, or title and main or added entry, are printed for manual matching. Failure to match the item against the data base results in placement of the RCD on the waiting file, to be matched against each week's incoming LC-MARC tape either until a hit occurs or until four weeks after receipt of the book, at which time original cataloging is initiated. Several libraries may be awaiting cataloging copy by this time; one library is designated to supply copy for all, so that each title in the system is cataloged only once.

Locally created catalog records, whether from LC-NUC source or original cataloging, are filled in on a worksheet by the cataloger (Figure 4). These records are edited for content (since some participants lack adequate cataloging tools) and tagged by WSL Input Center

staff, then keyed onto an MTST cassette and translated via Digidata machine to a magnetic tape acceptable by the computer. Proof sheets (Figure 5) are produced from the computer for subsequent checking at the Input Center until final verification.

Manual files based on the original multiple order forms are maintained to allow monitoring of the system. Hits are matched against these files, original cataloging decisions are triggered, title receipt is noted, problems are discovered: general control of the system is exerted. This duplication of manual and machine files is necessitated by the system design, which failed to provide for adequate control information. In order to bring into correspondence both manual and machine-readable data, listings of the contents of the Working File and the Waiting File are printed on demand. While the problem could be solved by some reprogramming, it was decided to turn efforts to development of the on-line capacity, which will obviate the manual file and allow machine files to be monitored via CRT terminals.

Careful quality control is exerted throughout this manual operation in the areas of bibliographic content, adherence to accurate MARC II content designators, authority file verification, detection of keying and computer errors, and output quality of cards, labels, the quarterly Resource Directory and the individual libraries' biweekly listings of titles acquired since the latest directory issue.

Computer System. Weekly inputs include about 3000 MARC records from LC, 250-300 locally keyed bibliographic and vocabulary (verification of names and subjects, with see, see also, and notes) records in MARC

format on magnetic tape, punched cards for 5000 records of order and holdings data, and about 200 update and search notices. Weekly outputs include catalog cards and processing labels, and listings for system control (e.g., proof sheets for locally created MARC records, printout of hits on title key or title/main or added entry key searches, and computer run statistics). At two-week intervals each library receives an individualized cumulative computer listing of titles received between the quarterly publications of the Resource Directory. Special lists such as the annual Washington State Publications and a catalog of the Washington State Library's film collection are examples of less frequent products. Irregular outputs include management information such as statistics on overlap of holdings or listing of the Waiting File for human inspection. Selected records are occasionally output in either printed or machine-readable form, on request of a non-member library or for input to another library's computer system. A special Alaskan catalog is now being produced for the Alaska State Library and the University of Alaska Library, under contract with Boeing Computer Services.

As indicated in the flow diagrams for the batch mode computer system (Figures 1 and 2), the Library of Congress MARC tape for books is received and input weekly (film records arrive biweekly); any matches against records on the Wait File produce catalog cards and labels and link a library holding symbol to the MARC record. Matched records go to the Master File; others to the Residual File. Original cataloging is input through edit programs for quality control; both LC and local records then go into the bibliographic maintenance program where modifications

may be made. The bibliographic update program will delete records, add new or modified records to the Master or Residual Files, and move records from one file to the other. Both bibliographic updates and requests for cataloging feed into the holdings update program which adds, deletes and replaces information on the Holdings File (linking bibliographic record to holding library) and passes on requests to the products-on-demand subsystem, which produces RTR and catalog cards and labels according to library profiles.

The bibliographic update program also provides input to the change processor program which maintains all changes to bibliographic content and holdings information.

The access service programs permit an LC card number search, title search, or title/main entry search. This set of routines will search any of the files. It is also possible to search by title/main entry and receive the ID number of the record from the computer.

The above programs are operated weekly and in early 1975 required 38.75 minutes of CPU time and 6 hours of off-line printing. Additionally, bi-weekly runs for local bibliographic input and two-week title listings require 8.75 minutes of CPU time and 2 hours of off-line printing. Monthly runs, such as vocabulary input and merge of LC-MARC cumulated tapes, require 14 minutes of CPU time and $3\frac{1}{2}$ hours off-line printing.

Maintenance of the computerized name and subject authority file requires manual intervention. Terms in newly input records (1xx, 6xx, and 7xx fields) are matched by computer against the existing authority file and non-hits listed for human decision. On demand, a complete

vocabulary listing is printed by the computer (Figure 6) for human monitoring. Verification and cross references (see and see also) are determined by consulting the Library of Congress Subject Headings. As indicated in the flow diagrams of Figures 7 and 8, vocabulary data (verification of headings, cross references, and scope notes) are input as necessary via the MTST with Digidata translation, creating and maintaining the Vocabulary Master File. Reciprocal records are machine generated for all reference terms (i.e., see and see from, see also and see also from).

The Resource Directory is produced in quarterly cumulative supplements, with annual total cumulations. Sample pages are shown in Figure 9. An additional list is produced every two weeks between supplements: a separate computer printout for each library, listing titles acquired since the previous supplement was produced (Figure 10). The Resource Directory contains all titles acquired by the participating libraries since 1 July 1972. The register-index structure is used; that is, the register volume contains complete bibliographic records numbered sequentially in order of input to the computer and the indexes (author, title, and subject volumes) contain limited bibliographic information plus holdings and call numbers attached to each record. This arrangement permits changing holdings and call numbers without the necessity for reprinting the entire record; it also avoids the need for reprinting the register, since a record may be deleted simply by eliminating its index references or it may be altered, reprinted, and given a new ID number so that the incorrect record is no longer indexed. Thus, each quarterly printing of the Resource Directory includes an additional volume of the

register and the appropriate cumulative indexes. This structure has proved satisfactory; problems lie in the area of massive growth (as for any ongoing book catalog) and microform production is under investigation. Also, a book catalog is never up to the minute, requiring 4 to 6 weeks from data base cutoff date to book-in-hand.

The computer programs which produce the Resource Directory are diagrammed in the lower left corner of Figure 1 and in Figures 11, 12 and 13. Input comes through the Change Processor program and the previous cumulation tape. The register and index supplements go onto a tape, with the indexes then run against the cross reference program. Both register and index data are then put through the Photocomposition Precompressor program which provides the interface to the photocomposition hardware. A commercial vendor produces the camera-ready master pages, after which the State Printer manufactures the books. The photocomposition programs are those developed at the New York Public Library; considerable developmental effort was saved by New York Public Library's interinstitutional generosity.

File and Record Layouts. Eight permanent Basic Direct Access Method files are maintained in the system. The Master File contains bibliographic records for which holdings exist. The Residual File contains bibliographic records from the LC-MARC tapes which as yet have no corresponding holding record. The Holdings File contains a record corresponding to each active record in the Master File; data include holding library symbols and local call numbers (record layout is shown in Figure 14). The Working File is used for bibliographic records held for modification or verification.

The Waiting File receives Requests for Cataloging Services and holds the data until cataloging information is available (Figure 15). The T/E Access File holds records consisting of a compressed title/main entry key accompanied by the ID number for the corresponding record in the Master or Residual File. The access key is computer-generated using a compression algorithm based on the work of Newman and Buchinski.[7] For titles and corporate names, the key is made up of the first two consonants of the first four significant words; for personal names, six characters or less form the key, with vowels removed as necessary beginning from the right. The IDN Access File contains ID numbers, each with two pointers: one to the bibliographic record and the second to the holding record. The Vocabulary File contains verified forms of name, uniform title, and subject terms and their reciprocals; the record format for the Vocabulary File as shown in Figure 16. The following summarizes the file organization:

File	Access Key	Record Order in File
Master	File/Set/Page/Record	by date added
Residual	File/Set/Page/Record	by date added
Holdings	File/Set/Page/Record	by date added
Working	Record ID Number	by Record ID No.
Waiting	Record ID Number	by Record ID No.
T/E Access	Title/Entry or Title only	by Title/Entry
IDN Access	Record ID Number	by Record ID No.

The system grows by one additional 3336 disk pack about every 40 weeks. File growth is shown in the following table.

NUMBER OF RECORDS
IN WASHINGTON LIBRARY NETWORK FILES

File Name	Average Record Size (bytes)	Dec. 1972	June 1973	Oct. 1973	June 1974	Oct. 1974	Dec. 1974
Master file	648	4,613	16,500	30,600	48,000	60,600	68,900
Residual file	648	234,798	334,000	364,900	417,000	468,100	500,000
Holdings file	110	4,613	13,500	29,000	46,100	64,900	82,700
IDN Access file	16	239,411	350,000	395,000	459,600	503,400	531,000
T/E Access file	50	330,280	493,000	502,400	637,300	698,800	737,500
Vocabulary file	220	4,132	7,300	59,500	89,400	103,500	108,800

IMPACT

The statewide impact of the Resource Directory publication has been both pleasant and painful: pleasant in its aspect of promoting the circulation of library materials within systems and on the interlibrary level, and painful in saving person-hours in cataloging and processing, and in the consequent need for personnel to handle proliferating intra-system circulation and interloan requests, especially in districts where no branch catalogs have previously existed. While other variables probably contribute to the increase in use of library materials, growth has been so marked and so timely as to assure that the Resource Directory has had a profound effect.

The Resource Directory has from the onset been distributed to all libraries of the state; it travels on bookmobiles as well. The holdings of the participating libraries are therefore exposed to the scrutiny of patrons with resultant rise of use. For instance, the North Central

Regional Library reports an increase of 10% from 1973 to 1974 for requests forwarded to the State Library (which is last resort, if other locations are listed); a doubling of requests to borrow from other libraries, exclusive of the State Library; an increase of 15% in interlibrary lending; an improvement in speed of response to patrons' interloan requests. Total outgoing loans for all district participants in 1974 were $4\frac{1}{2}$ times the number for 1972. (1971 to 1972 figures showed an increase of less than 1/3.) One district library's loans increased from 3 in 1972 to 529 in 1974. These librarians are gratified at becoming lenders as well as borrowers--at the same time they have found that the personnel slack produced by computer assistance to cataloging procedures has been taken up by mushrooming readers' service efforts. The result is as hoped: improved service without proportionally increased costs. A municipal library not now participating in the system reports a decrease of 6 percent in books loaned to public libraries, and an increase of 144 percent in borrowing from other libraries. The distribution of the Resource Directory to all libraries in the state coincides with these reported effects; circumstances indicate relationship even though no cause-effect has been proved.

Two of the district library systems have discontinued card catalogs in branches, with the Resource Directory as substitute, and others are considering closing off central as well as branch card catalogs. Two of the systems do not maintain card catalogs; the Resource Directory provides the only access to their own as well as other libraries' holdings. It is estimated that card catalog maintenance to provide information equivalent

to that in the Resource Directory in headquarters and branches for participating libraries would cost $1,263,800 per year.

Availability of cataloging data has also benefited participants; the bibliographic record is available from LC-MARC for more than 90 percent of the titles and in the remaining cases is provided by one library for the use of all. One participating system eliminated a 6-month cataloging backlog within 8 weeks after joining the system. This system has since eliminated three persons from technical services (two by attrition and one by transfer to public services) while maintaining the same output in technical services.

For both participating and non-participating libraries, the Resource Directory is a book selection tool, and some non-participants who lack cataloging tools use it as a source for cataloging data.

In several of the participating systems, patrons and librarians in the branch libraries had no at-hand information on holdings anywhere in the system other than the specific branch. Librarians report a marked increase of circulation rate within district library systems, especially where branches now have information not previously available regarding materials held in the district. The total circulation for participating district libraries for 1974 is 12% above circulation in 1972, and one district reports an increase of 27% from 1972 to 1974.

With this evidence, other libraries have been eager to participate in the system's benefits. Unfortunately, manpower and space limitations at the State Library, and the restrictions of the batch process and central input/output control, have effectively prevented expansion of the services.

PROBLEMS OF BATCH SYSTEM

The major bottleneck in the batch-mode system has been the manual operation dealing with computer input and output. In order to maintain quality control these procedures have been centralized, and throughput for the State Library and eight system libraries has so glutted the pipeline that no additional libraries can be added under present circumstances. While quality control will continue to be a major emphasis in the on-line system, the man-years necessary to exercise adequate control will be in a much smaller ratio to the traffic in the system, since participating libraries can directly query the data base for bibliographic records and input holdings against files. Local input will still require verification for authority and content designator control, in one or more locations. The keeping of all locally input records is now accomplished at the Input Center; the on-line system will permit keying from a participating library, with only verification at a center for quality control. Present file maintenance and handling of hard copy for both bibliographic and vocabulary data, plus tagging, keying, and editing all input for the computer, and cutting and distributing cards and labels requires a staff of 7.3 full-time equivalents. It is estimated that 4 F.T.E. might maintain quality control for the throughput of 55 to 75 libraries, when the participating libraries will deal directly with the system via on-line terminals.

Another burden in the manual operation has been updating of the vocabulary system; any new name or subject which does not match a term in the file is printed out for human inspection. An added subfield on an already verified term will cause the entire subject to be printed out and

requires verification. Any changes in the LC authority listing necessitate manual input of changes. These problems will be alleviated in the design of the on-line system, so that previously verified subfields may be appended to previously verified main terms and accepted by the computer even though they have not appeared together previously, and one-for-one substitution of new name or subject can be made to the vocabulary file and then be reflected automatically in each related record.

Receiving, sorting and mailing the catalog cards and labels is also a chore which is expected to be decentralized with the on-line system. Area processing centers are anticipated; these would have the capability of printing products and distributing materials to the area libraries. Some processing centers may serve a single large library. Specific patterns of implementation are still under discussion.

The weekly operation of the system has resulted in such attenuated turnaround that input of local records, from tagging and editing to keying to proofreading to final verification, spans a minimum of two weeks, and often four or more weeks when corrections must be input between proofing and verification. Vocabulary update can occasion similar overlong delays in availability of the information. The on-line system, with immediate update and access, should not be subject to these difficulties.

The physical growth of the Resource Directory has already been mentioned. While microform production is one potential solution, it is also expected that libraries having display terminal access to the data base will no longer require hard copy. Thus, the Resource Directory may be needed only by small libraries and bookmobiles; probably readers and

COM fiche or cartridges will be used in these instances. It is contemplated that custom catalogs might be produced for individual libraries or groups of libraries. Four or five terminals are anticipated for the larger libraries, to satisfy both processing and patron use.

HOLDINGS OVERLAP AND COST DATA

Tally of holdings overlap is provided on demand by the computer. The following data represent titles acquired by the participating libraries between July 1972 and January 1975; the overlap may be underrated because some of the same titles may have been acquired by some libraries before or after that period of time. Unique titles totaled 54,528* at the end of December 1974, with each title held by an average of 2.1 libraries. Titles held by only one library were 58.4 percent of the total. Of the titles held by more than one library, the average number of libraries holding each title was 3.6. The overlap might be expected to decrease as academic libraries are included; present participants, except for the State Library which holds 30.5 percent of the uniquely-held titles, tend to have similar acquisition patterns.

Costs of the present batch mode bibliographic subsystem are shown below. Catalog cards cost $0.35 per set (2 main cards and subject and added entry headed cards) and $0.05 per additional main card; labels cost $0.07 per set of 1 spine label and 2 book card/pocket labels. The Resource Directory if continued with the same number of libraries and titles added in 1975 will cost an additional $26,500 for 400 copies, since the end-of-year total cumulation would be larger (July 1972 to end of 1975).

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*This figure does not match the 68,900 in the table on page 19, since the Master File contains some records to which no holdings have yet been attached.

Costs - WLN Bibliographic system, batch mode for 8 district library systems and WSL, 1974 (70,000 titles added)

Maintenance of system (salaries, back-up, tuning of programs)	$104,000
Computer production costs	90,000
Card and label costs	39,000
Human labor, central operation	75,000
Resource Directory (400 copies) & 2-week listings	125,000
Postage and miscellaneous	15,000
Total	$448,000

= 49,800 average per library

= $6.40 per title

CHRONOLOGY OF RECENT DEVELOPMENTS

The Washington Library Network system was from its inception intended to be eventually transformed into an on-line operation; the original batch construct was adopted under time and money pressures. After the Pilot Resource Directory was produced in December 1972, a request was made to the state legislature in 1973 to fund the next developmental stage, which was to bring the cataloging module on-line and to add the acquisitions module to the system. Funding was not appropriated at that time. The Council on Library Resources granted $25,000 in spring 1973 which was used to make a survey of statewide library needs relative to an acquisitions module.[8]

In 1973 the state legislature created a new agency, the Data Processing Authority, to improve the efficiency of computer utilization throughout state government. Under the auspices of the DPA, a Library Automation Committee

was formed in 1974 with representatives from the universities, four-year and community colleges, public libraries and the State Library. This committee is charged with overseeing the development of an integrated computer system to assist the operations of all libraries of the State of Washington. Areas of investigation and coordination include the on-line development of the bibliographic system, integration of the cataloging module and the acquisitions/accounting module which is in operation at Washington State University, design of circulation and serials control modules, and evaluation of approaches to retrospective conversion.

In 1974 the state legislature appropriated funds for on-line development of the bibliographic system; this effort is now in the advanced design stage along with design for integration of cataloging and acquisitions.

The on-line acquisitions system developed at Washington State University will, with some modifications, become the next module to be added to the bibliographic data subsystem.[9] The integrated system will furnish pre-order search and verification services, maintain in-process records for all forms of materials, maintain fund accounting records, furnish management information, and create products for participating libraries in accordance with profiles: purchase orders, claims, fund reports, acquisition lists, and such; and will attach holdings information to bibliographic records as materials are acquired.

The integrated acquisitions/bibliographic modules are planned to be implemented by the end of 1975, with some 50 libraries participating within the following year and a half via CRT terminals. During the summer of 1975, pilot operations of the acquisitions system will be

undertaken at Western Washington State College, The Evergreen State College, and Seattle Public Library.

The on-line system will incorporate machine-readable authority files, full MARC coding at both input and output points, location symbols for titles held, bibliographic information, order and claim routines, an accounting subsystem, and catalog cards and book processing materials, with the capability for custom book catalogs on demand. Quality control continues to be a major emphasis.

CONCLUSION

The foregoing is a description of the Washington Library Network's computer system as it has functioned for about three years, assisting eight district library systems and the State Library in cataloging/processing materials and producing union book catalogs.

Admittedly a cumbersome procedure at present, the batch system is being redesigned and will be implemented by December 1975 in an on-line mode. This style of operation will permit decentralization of input and initial editing, and obviate the extensive manual files now maintained centrally. In the on-line operations, the center will function chiefly for final quality control and for system monitoring and adjustment, with search of data base, input of order and receipt notifications, and local cataloging in full MARC format input from remote terminals for central verification. In combination with an on-line acquisitions/accounting subsystem, this segment of the WLN will become a powerful tool for library operations. In 1976, circulation and serials control subsystems are to be added.

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